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NICHE STUDIES IN THE STOCK OF STARLING (STURNUS V. VULGARIS L. 1758)

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Abstract

Author took stock of the nesting starling pairs in a marked section of the Tisza flood-plain between the period of 1978 and 1981. During the course of the observations the question arose whether there are any competitions in this habit between the starling and the tree-sparrow, also in hollow nestling there. Surveying was accomplished in case of both species regarding four niche dimensions: diameter of hollow-opening, height of hollow, volume of animal nutriment, and the time passing between feedings. From the data, the niche width and the niche overlapping were calculated, the latter also being controlled with the help of a method using computer. Despite the significant overlapping, no competition could be detected between the two species. The environmental capacity of the flood-plain forest is so great that the populations of the two species are kept well.

Introduction

Measurements were carried out between 1978 and 1981 concerning the nesting stock of starlings at the 3400 m long, 20—250 m wide flood-plain of the Tisza between Szeged-Tápé and Vesszős (Fig. 1). The plant-associations of the area are shown on Figure 2. It is characteristic that the area in under water periodically, generally from March to July, when for shorter-longer periods water overlaps the flood-plain. The starlings feeding their youngs bring the food to their nests in the forest from the agricultural fields. The nest settlements are in every case joined by a meadow-like region where the food can be obtained (COLEMAN 1972, MOEED 1976). Thus, author was able to count the birds coming in to feed and flying out to obtain food in his district, and concluded the number of nesting pairs (MOLNÁR 1980 — Table 1). In the studied flood-plain forest four, well-separable starling-colonies were observed (Fig. 1 — colonies are labelled by Roman numerals). For better reviewing the two larger nest settlements (I and IV) were divided into 2—2 parts. During the surveying of the colonies it was detectable that after the starling, the most frequently occurring bird nesting in hollow is the tree sparrow, the hatching period of which is also in conformity with that of the starling. The question arose whether there is any competition between the two species; since this has been observed between starling and Greatspotted Woodpecker (CERVA 1930), starling and Syrian woodpecker (SZLIVKA 1957), starling and stock dore (VARGA 1978). Therefore surveying was carried out in case of both species in four niche dimensions: diameter of hollow-opening; height of hollow; volume of animal nutriment, and period between feedings (Tables 2—5). The niche overlapping and niche width were calculated from the obtained data.

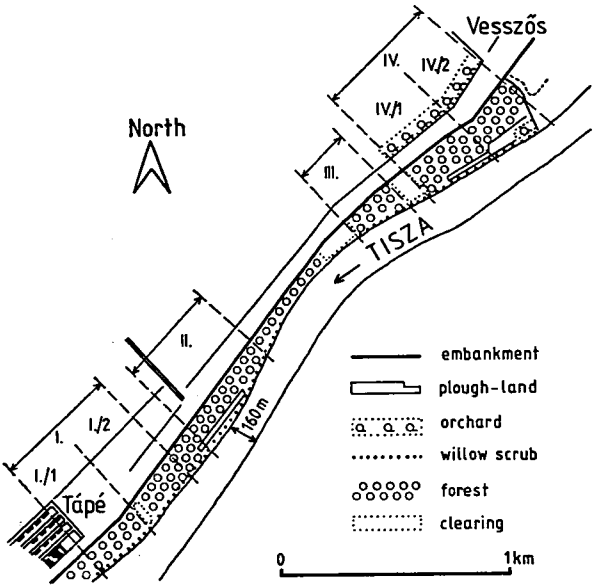


Fig. 1. The section of the Tisza flood-plain at Tápé-Vesszős and the location (I—IV) of the starling-colonies in the gallery forest.

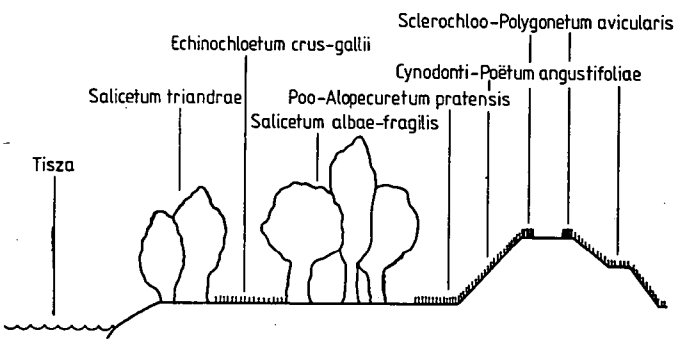


Fig.2. The plant-associations of the gallery forest at the Tisza flood-plain (according to BODROGKÖZY).

Methods

When making observations with binoculars weekly, author counted the feeding starlings from the top of the embankment, at well separable 300—400 m long sections. The number of nesting pairs (n) was calculated from the formula

$$n = \frac{x_{3t}}{t}$$

where x stands for the number of times the birds flew in within 3t time, and t being the average of the period between feedings. For starlings, t=3,66 minutes; for tree-sparrows, t=2,66 minutes.

The periods of feedings were measured with chronometer, the diameters of hollow-openings with sliding caliper, the height of hollows with measuring rod. The volume of animal nutriment was

gathered from the literature (PAPP 1943, MÓCZÁR 1969, RÉKÁSI 1970, 1975, 1978, 1980, MAGYAR 1973, 1976, 1981, SZIJJ 1957).

The following methods of evaluation were applied for the niche studies: the niche overlapping was determined with the help of the Renkonen-index:

$$C_{ih} = 1 - 0{,}5 \sum_j (P_{ij} - P_{hj})$$

where C_{ih} means the niche overlapping between the species of the i and h orders. P_{ij} is the relative frequency of the species of the i order in given j resource state, P_{hj} is the relative frequency of the species of the h order in the same condition.

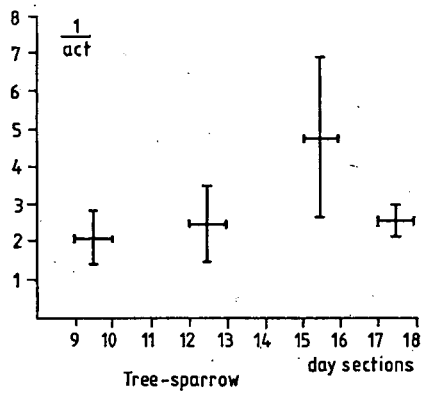
The multi-dimensional niche overlapping was calculated on the basis of GALLÉ's method (unpublished) with the help of a computer, where the P_i values are the elements of an n-dimensional matrix — obtained by the Descartes-series of the individual niche dimensions.

The niche width was calculated by the formula of Shannon—Weaver:

$$H(S) = -\sum_i p_i \ln p_i$$

Results

The stock of nesting starlings in the studied floodplain sections was surveyed in 1978, 1980 and 1981 (Table 1). The number of hatching pairs varied annually. The



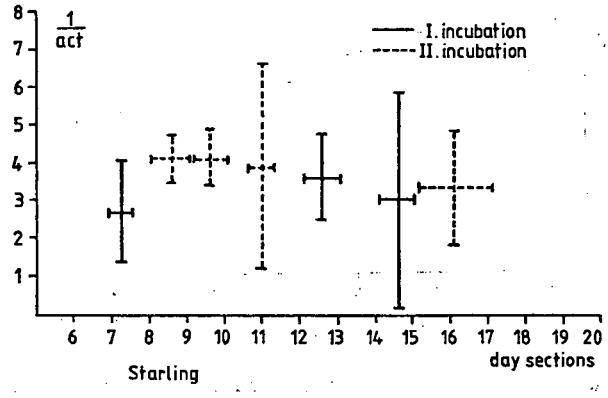


Fig. 3—4. Part-day activity of alimentation of the tree-sparrow and starling.

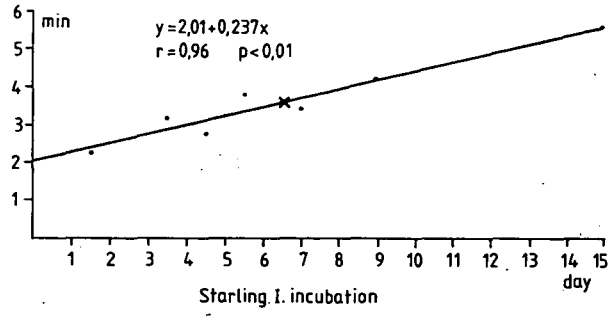
pairs of the second hatching were also surveyed in 1981, in which case 55,5% of the pairs took part compared to the first one (Table 1). With the advancing of the youth rearing the earlier nesting pairs have their youngs leave the nest, therefore the number of feeding pairs gradually decreases (Table I, on the right of the dotted line). The number of tree-sparrows nesting in the area is 45% that of the starling pairs.

The following conclusions could be drawn from the niche analysis:

the values of the niche width (Table 6) show that the starlings make use of the resources in a wider province than the tree-sparrows.

The niche overlapping is of significant degree, the value being around 0,5 (Table 6). Nevertheless, in practice, author did not observe situations referring to competition, which gave rise to the problem that the representation of the dimensions in coordinate system shows a greater overlapping than in reality (Figs. 7—10). Therefore, with a multivariable method (GALLÉ 1981) the complete data was computerized, thus the value of the niche overlapping came to 0,2428. The overlapping, however, does not also mean competition. The resources of the flood-plain are so abundant that they would be capable of keeping even much larger populations of the two species.

The overlappings are well observable on the graphs of the four niche provinces Figs. 7—10). A few consequences, however, could further be drawn from these. In



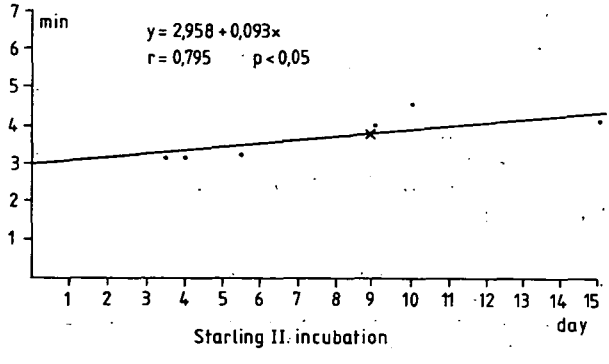


Fig. 5—6. Illustrations of feeding time of the starling's first and second incubation, regarding the advance in youth rearing.

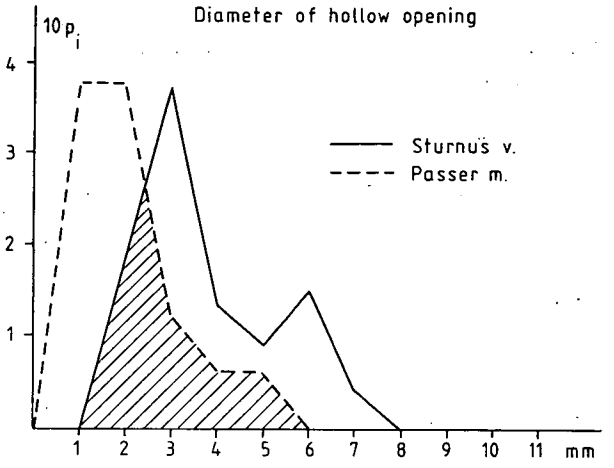


Fig. 7

Fig. 7—10.: Demonstration of overlappings regarding the diameter of hollow-opening, height owl hollow, volume of animal nutriment and feeding times in the case of starling.

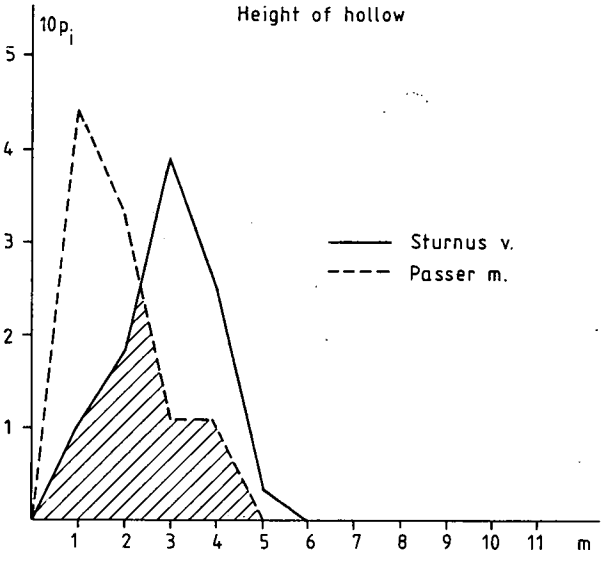


Fig. 8

every case, the graph line of the tree-sparrows comprehends smaller provinces on the horizontal axis than that of the starlings, and it reaches higher vertically.

Therefore, the tree-sparrow consumes less animal nutriment, feeds more frequently, and has its nest lower, in a hollow with smaller opening than the starling. These facts may probably be in relationship with the differences in body size of the two species.

The registration of feeding times made it possible to illustrate in co-ordinate system the part-day activity of the two species (Figs. 3 and 4), as well as the frequency of feeding related to the age of the young birds, too (Figs. 5 and 6). In the case of

starlings, it can be seen from the significant data of both the first and second incubation that with the advance of youth rearing the time elapsing between feedings becomes longer progressively, thus as the young birds grow, their parents feed them rarer. According to the measurings of GYURKÓ (1959) this is also the case regarding hei treesparrow. These data can also be comprehended as the studies of a fifth niche-da mension.

The starling and the tree-sparrow are species occurring in large numbers in the living place of the flood-plain. It is characteristic that their reproduction cycle takes place in the gallery forest, but they obtain their insect aliment from the joining agicultural fields and meadows. Their consumption of insects is considerable in this period, therefore the individuals of the populations of these two species are the significant consumers of the flood-plain—agricultural field ecosystem. The biocenoses of the living-space at the Tisza river are not known well enough as yet, therefore it is important to study the structure of the animal cenoses — for example that of the bird populations — in this ecosystem, too.

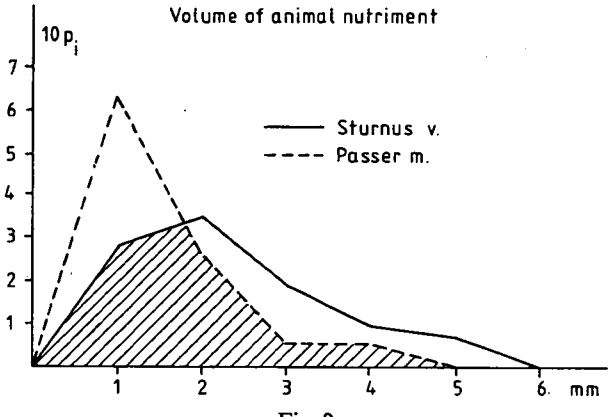


Fig. 9

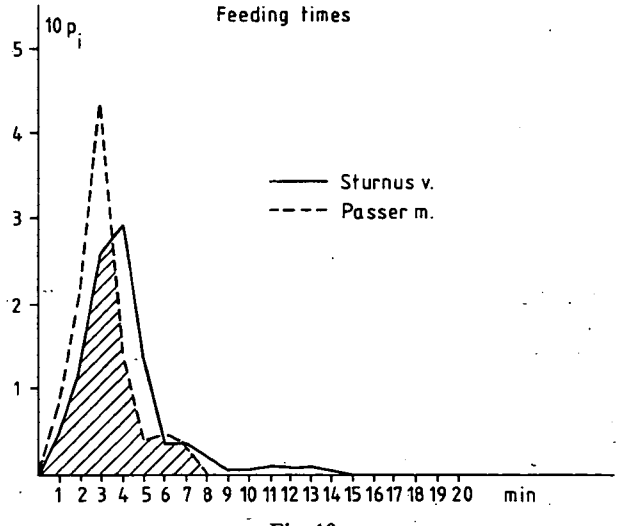


Fig. 10

Table 1. *The stock of nesting starlings at Tápé—Vesszős between 1978 and 1981. On the right of dotted line: with the advancing of youth rearing the pairs of the colonies have their youths fly out of the nests (1978).*

Numbering of populations	Year	1978 pairs	1980 pairs	1981 pairs of I. incubation	1981 pairs of II. incubation	1978		
						20. V.	25. V.	31. V.
I.	I./1	10	26	16	12	15	12	4
	I./2	5	6	9	2			
II.	II.	6	6	6	3	6	5	2
III.	III.	5	4	7	1	5	5	0
IV.	IV./1	35	10	16	8	53	25	2
	IV./2	18	9	9	7			
Total number of pairs		79	61	63	35	79	47	8
Percental ratio		—	—	100%	55,5%	100%	59,5%	10,1%

Table 2—5. *Data of measurements concerning the diameter of hollow-opening, height of hollow, volume of animal nutriment and feeding times related to starling and tree-sparrow.*

Volume of animal nutriment

	Serial number Millimetres	1 0—10	2 11—20	3 21—30	4 31—40	5 41—50	6 51—60	7 61—70	8 71—80	9 81—90	10 91—100	11 101—110	12 111—120
S_1	Sturnus vulgaris	12	15	8	4	3	0	0	0	0	0	0	1
S_2	Passer montanus	12	5	1	1	0	0	0	0	0	0	0	0

Feeding times

	Serial number Minutes	1 0—1	2 1—2	3 2—3	4 3—4	5 4—5	6 5—6	7 6—7	8 7—9	9 8—9	10 9—10	11 10—11	12 11—12	13 12—13	14 13—14	15 14—15	16 15—16	17 16—17	18 17—18	19 18—19	20 19—20
S_1	Sturnus v.	13	34	74	83	38	10	11	5	2	2	3	1	1	2	0	0	1	0	0	1
S_2	Passer m.	7	18	36	12	3	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 6. *Values of niche width and niche overlapping in case of starling and tree-sparrow.*

	Niche width H (S)		Niche overlapping
	Sturnus v.	Passer m.	C_{in}
Diameter of hollow opening	1,731	1,340	0,424
Height of hollow	1,494	1,214	0,508
Feeding times	1,905	1,563	0,685
Volume of animal nutriments	1,525	0,947	0,648

Values of four-factoral niche width and niche overlapping

Diameter of hollow-openings

	Serial number Millimetres	1 21—30	2 31—40	3 41—50	4 51—60	5 61—70	6 71—80	7 81—90	8 91—100	9 101—110	10 111—120	11 121—130
S_1	Sturnus vulgaris	0	8	17	6	4	7	2	0	0	1	1
S_2	Passer montanus	6	6	2	1	1	0	0	0	0	0	0

Height of hollows

	Serial number Metres	1 1—2	2 2—3	3 3—4	4 4—5	5 5—6	6 6—7	7 7—8	8 8—9	9 9—10	10 10—11	11 11—12
S_1	Sturnus vulgaris	3	5	11	7	1	0	0	0	0	0	1
S_2	Passer montanus	4	3	1	1	0	0	0	0	0	0	0

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Niche vizsgálatok seregély (Sturnus v. vulgaris L. 1758) állományban

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Kivonat

A Tisza hullámterének egy kijelölt szakaszán mérte fel a szerző a fészkelő seregélypárok számát 1978—1981 közt. A megfigyelések közben felvetődött a kérdés, hogy van-e ebben a habitatban kompetíció a szintén odufészkelő mezei veréb és a seregély között? Négy niche dimenzióban — az odunyílás átmérője, az odu magassága, az állati táplálék nagysága, az etetések közt eltelt idő — végzett felméréseket mindkét fajnál. Az adatokból a niche-szélességet és a niche átfedést számította, utóbbit egy számítógépes módszerrel is kontrollálta. A jelentős átfedés ellenére nincs kompetíció a két faj között. A hullámtéri erdő környezeti kapacitása olyan nagy, hogy a két faj populációit jól eltartja.

Анализы Niche в составе скворцов (Sturnus v. vulgaris L. 1758)

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Резюме

Автор статьи подсчитывал количество гнездящихся на выделенном участке долины Тисы пар скворцов в 1978—1981 гг. В ходе наблюдений возник вопрос о том, существует ли в этом габитате конкуренция между гнездящимися там же полевыми воробьями и скворцами. Для обоих видов были проведены наблюдения в 4 измерениях niche: диаметр дупла, количество животного корма, высота дупла и время между кормлениями. На основе этих данных автор определил niche — ширину и niche — перекрытие, контролируя последний показатель и методом электронно-вычислительного подсчёта. Вопреки значительному перекрытию, между двумя видами нет конкуренции. Лес поймы и окрестности обеспечивают условия существования популяций обоих видов.

Istraživanje ekoloških niša na populaciji čvorka (Sturnus v. vulgaris L. 1758)

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Abstrakt

Autor je u periodu 1978—1981. godine vršio utvrdjivanje broja parova čvoraka na odredjenoj deonici plavne zone reke Tise. Tokom osmatranja postavilo se pitanje, postoji li u ovom habitatu kompeticija izmedju čvorka i poljskog vrapca, koji je takodje dupljarica?

Ispitivanjem za obe vrste bile su obuhvaćene četiri niše: prečnik ulaznog otvora duplje, visina na kojoj se nalazi duplja, veličina plena, interval izmedju dva hranjenja. Na osnovu dobijenih podataka računskim putem utvrdjena je veličina i preklapanje niša. Preklapanje niša je prekontrolisano pomoću kompjutera. Konstatovano je da se ni pored značajnih preklapanja na javlja kompeticija izmedju ovih vrsta. Kapacitet sredine plavnog područja obezbedjuje opstanak populacija obe vrste.